From Complexity to Neutrosophy: A Pedagogical Proposal from N-alectics and Latin American Worldview

Maikel Yelandi Leyva-Vázquez

Affiliations:
Universidad Bolivariana del Ecuador, Durán, Ecuador.
Universidad de Guayaquil, Guayaquil, Ecuador.
Centro de Investigación Institucional, Universidad Bernardo O'Higgins, Santiago, Chile.
ORCID iD: https://orcid.org/0000-0001-7911-5879
E-mail: maikel.leyvav@ug.edu.ec

Noel Batista-Hernández

Affiliation: Universidad Bolivariana del Ecuador, Durán, Ecuador.
ORCID iD: https://orcid.org/0000-0002-2975-2113
E-mail: nbatistah@ube.edu.ec

Florentin Smarandache

Affiliation: University of New Mexico, Gallup, NM, United States.
ORCID iD: https://orcid.org/0000-0002-5560-5926
E-mail: smarand@unm.edu

Abstract

This article explores the limitations of Edgar Morin's theory of complexity within the pedagogical field and proposes a broader framework through the integration of Florentin Smarandache's neutrosophy and n-alectics with contributions from Latin American worldview and philosophy. It argues that while Morin's complexity diagnoses the need for a mode of thinking that reconnects knowledge domains, it lacks a sufficiently robust logic and praxis to manage the uncertainty, contradiction, and neutrality inherent in educational processes. In contrast, neutrosophic logic (Truth, Indeterminacy, Falsity) and its n-alectic extension provide a conceptual scaffolding which, in dialogue with decolonial thought and the Latin American notion of Buen Vivir, enables the articulation of a transformative pedagogy. This pedagogy not only acknowledges the multiplicity of knowledge systems but also embraces indeterminacy as a creative force and neutrality as a space for intercultural dialogue, thereby overcoming the binary and Eurocentric biases that still underlie complexity-based approaches. Finally, concrete pedagogical proposals are outlined for curriculum design, teaching practice, and assessment, aimed at cultivating subjects capable of inhabiting an uncertain and plural world.

Keywords: neutrosophy, n-alectics, pedagogy, theory of complexity, Latin American philosophy, decolonial thought.

Introduction

The crisis of modern educational paradigms, anchored in simplification, knowledge fragmentation, and a linear vision of progress, has driven the search for new epistemic frameworks that allow us to understand and inhabit the growing complexity of the contemporary world. In this context, complexity theory, popularized by French philosopher and sociologist Edgar Morin, has emerged as one of the most influential proposals in recent decades (Morin, 1999). His call to "reconnect" knowledge through principles such as the

dialogical, recursive, and hologrammatic has inspired educators worldwide to rethink the ends and means of education (Alhadeff-Jones, 2009).

However, despite its undeniable diagnostic value, Morin's proposal presents significant limitations when attempting to translate it into concrete and transformative pedagogical praxis. The main criticism, which this article endorses, is that Morinian complexity, while identifying the limits of simplifying thought, fails to completely transcend the binary and dialectical logic of Western tradition (Batista-Hernández, Leyva-Vázquez, & Batista-Barallobre, 2025). Furthermore, its eminently abstract and universalist character makes it difficult to anchor in specific cultural and political contexts, such as Latin America, marked by the colonial wound and the struggle for the decolonization of knowledge (Quijano, 2000).

Given this panorama, this work postulates that an articulation between neutrosophy and n-alectics, developed by mathematician and philosopher Florentin Smarandache, and the contributions of Latin American worldview and philosophy, can offer a superior horizon (Smarandache, 2014). Neutrosophy, as a new branch of philosophy that studies the origin, nature, and scope of neutralities, introduces a fundamental component that classical dialectics and Morin's complexity omit: indeterminacy (I) as an autonomous state between truth (T) and falsity (F) (Smarandache, 2016). From this trichotomous logic derives n-alectics, a supersession of dialectics that, instead of seeking the superseding synthesis of opposites, explores the dynamics between an entity <A>, its opposite <anti-A>, and its neutral <neut-A> (Smarandache, 2013).

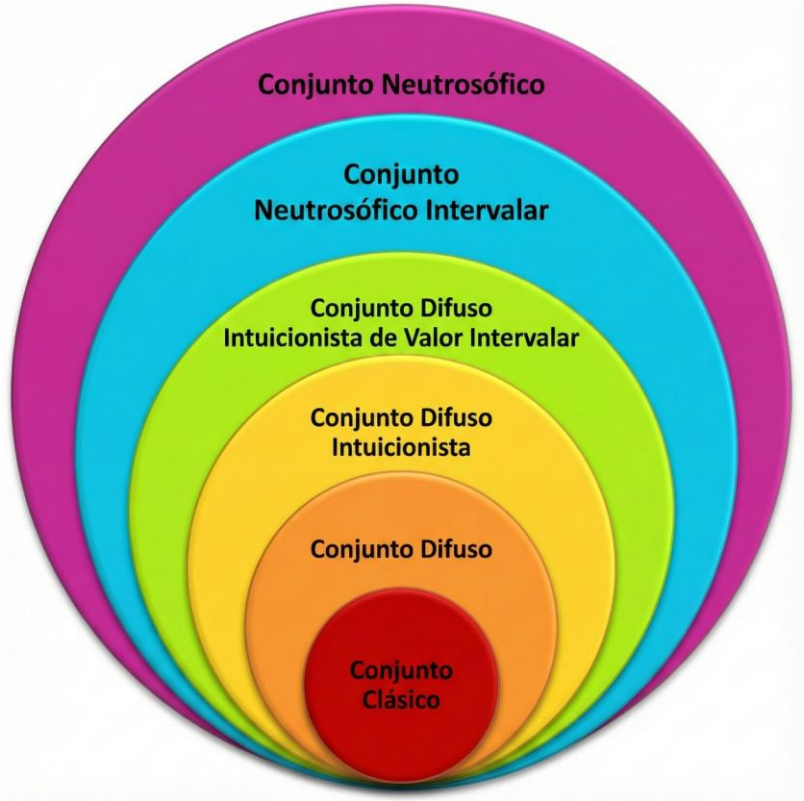

Figure 1 *Hierarchy of generalization from classical sets to neutrosophic sets*

This conceptual scaffolding, when placed in dialogue with the richness of Latin American philosophy and worldview—with concepts such as "Buen Vivir," communality, and critical interculturality—allows the construction of a pedagogical proposal that not only recognizes complexity but embraces it in its multiple dimensions: epistemic, political, ethical, and

aesthetic (Walsh, 2009). It is argued that this "Latin American neutrosophic pedagogy" is better equipped to deal with uncertainty, promote the dialogue of knowledge, and form citizens with critical and creative thinking, capable of navigating the contradictions of the 21st century without succumbing to paralysis or dogmatism.

The article is structured in five parts. The first presents a critical review of Morin's complexity theory and its applications in pedagogy, highlighting its main contributions and limitations. The second introduces the foundations of neutrosophy and n-alectics, as well as key concepts from pertinent Latin American philosophy. The third section develops a comparative analysis between both theoretical frameworks, demonstrating how the neutrosophic-Latin American perspective overcomes the aporias of complexity. The fourth section presents concrete pedagogical proposals, including the nQCA methodology. Finally, the application of neutrosophy in AI systems and LLMs as pedagogical tools is explored.

1. Edgar Morin's Theory of Complexity: Contributions and Limits in Pedagogy

The work of Edgar Morin, and particularly his "Method," represents one of the most systematic and ambitious intellectual efforts of the 20th century to construct an epistemology equal to the challenges of our time (Morin, 1990). Against what he calls the "paradigm of simplification"—characterized by disjunction, reduction, and abstraction—Morin proposes a "complex thinking" that seeks to "reconnect" what classical thought separated: the object from its context, parts from the whole, the human from the biological, science from philosophy (Morin, 2004).

In the educational field, the reception of these ideas has been enthusiastic. Morin's proposal to "teach the human condition," "teach earthly identity," or "teach understanding" resonates deeply with the aspirations of a pedagogy that seeks to overcome curricular fragmentation and form global, critical, and solidary citizens (Morin, 2001). The seven kinds of knowledge necessary for the education of the future have become an unavoidable reference for educational reforms in various parts of the world (UNESCO, 2001). Complex thinking invites schools to abandon the transmission of inert knowledge and embark on the adventure of constructing pertinent knowledge that accounts for contexts, the global, the multidimensional, and ultimately, the complex.

The principles of complex thinking offer conceptual tools for this task. The **dialogical principle** allows maintaining duality within unity, associating terms that are both complementary and antagonistic. The principle of organizational recursivity breaks with the linear idea of cause-effect, showing how products and effects are simultaneously causes and producers of what produces them. Finally, the hologrammatic principle reminds us that not only is the part in the whole, but the whole is also in the part (Morin, 2004). These principles, applied to pedagogy, suggest a non-linear curricular design, an evaluation that values process as much as result, and a teacher-student relationship based on dialogue and co-construction of knowledge.

However, despite these valuable contributions, Morin's proposal is not exempt from criticisms and limitations, especially when attempting to bring it to the terrain of pedagogical practice in non-European contexts. One of the most recurrent criticisms is its metaphorical and poorly operationalizable character. Morin describes complexity, celebrates it, but does not offer a formal logic or rigorous method to navigate it. His thinking, often dense and elusive, runs the risk of becoming a "rhetorical wild card" that justifies any vaguely holistic practice without true epistemic rigor (Reynoso, 2008).

A second limitation, more profound, is its anchoring in the Hegelian dialectical tradition. Although Morin seeks to overcome classical dialectics, his thinking remains trapped in the logic of contraries. Morinian complexity is essentially a dialectic of dialectics, a game of oppositions (order/disorder, unity/diversity, autonomy/dependence) that, while recognizing tension, continues to operate on a two-dimensional plane. As we shall see, this binary structure is insufficient to capture the richness of reality, which often manifests not only as opposition but also as neutrality, ambiguity, and indeterminacy (Smarandache, Vázquez, Cevallos-Torres, & Barco, 2025).

Finally, Morin's abstract universalism, despite his defense of diversity, presents problems from a Latin American perspective. His "human condition" and "earthly identity," although well-intentioned, run the risk of rendering invisible the profound power asymmetries and historical wounds that mark the peoples of the Global South (Quijano, 2000). Morin's complexity, by not incorporating an explicit critique of colonialism and Eurocentrism, may end up being functional to a new type of hegemonic globalization that, under the mantle of "unity in diversity," perpetuates existing structures of domination. It is here that dialogue with Latin American philosophy becomes not only pertinent but urgent.

2. Neutrosophy, N-alectics, and Latin American Philosophy: Foundations for a Decolonial Pedagogy

Against the limitations of Morinian complexity, a new horizon of thought emerges from the work of Florentin Smarandache and its articulation with the Latin American critical tradition. This section introduces the fundamental concepts of neutrosophy and n-alectics, then placing them in dialogue with our region's worldview and philosophy.

2.1. From Fuzzy Logic to Neutrosophic Logic

Neutrosophy, proposed by Smarandache in 1980, is a new branch of philosophy that generalizes Hegelian dialectics (Smarandache, 2014). Its starting point is the supersession of bivalent logics (true/false) and fuzzy logic. While fuzzy logic introduced degrees of truth and falsity, neutrosophic logic takes a further step by incorporating indeterminacy (I) as an autonomous and fundamental component (Smarandache, 2016). Thus, every proposition <A> is analyzed in a three-dimensional space (T, I, F), where T represents the degree of truth, I the degree of indeterminacy or neutrality, and F the degree of falsity. These three components are, in principle, independent of each other, and their sum can be less than, equal to, or greater than 1, which allows modeling uncertainty, ambiguity, vagueness, and contradiction in a much more precise way than previous logics (Smarandache, 2013).

Neutrosophy is a branch of philosophy that studies the origin, nature, and scope of neutralities, as well as their interactions with different ideational spectra. It considers a proposition, theory, event, concept, or entity <A> in relation to its opposite <antiA> and its neutral <neutA> (Smarandache, 2014).

This conception has profound implications for pedagogy. A learning process cannot be reduced to a simple acquisition of truths (T=1, F=0). The student constantly transits through states of indeterminacy (I): doubt, unanswered questions, unverified intuition, the coexistence of multiple perspectives. Traditional pedagogy, obsessed with certainty and the correct answer, tends to punish or ignore this space of indeterminacy. A neutrosophic pedagogy, by contrast, values it as an essential and potent moment of the knowing process.

2.2. N-alectics: Beyond Synthesis

N-alectics derives from neutrosophic logic and is a generalization of dialectics (Smarandache, 2013). While classical dialectics focuses on the dynamics between a thesis <A> and its antithesis <anti-A>, seeking a superseding synthesis, n-alectics analyzes the dynamics between <A>, <anti-A>, and <neut-A> (the neutrality between opposites). This neutrality is not passivity but an active space of coexistence, dialogue, and transformation. Furthermore, n-alectics can be refined to include multiple dimensions of truth, falsity, and indeterminacy (T1, T2...; I1, I2...; F1, F2...), allowing for a much more granular analysis of complex phenomena.

In pedagogical terms, n-alectics invites us to overcome the model of adversarial debate, where one position must triumph over another. Instead, it proposes a dialogue model where opposing positions (<A> and <anti-A>) are placed in relation not only to each other but also to possible zones of neutrality and partial agreement (<neut-A>). This is fundamental for education for peace and citizenship, where the objective is not to eliminate conflict but to learn to manage it creatively and non-violently.

2.3. Dialogues with Latin American Worldview and Philosophy

The neutrosophic and n-alectic proposal finds a surprising and potent echo in the Latin American tradition of thought. The critique of binarism and Eurocentric thinking has been a constant in liberation philosophy and decolonial studies (Quijano, 2000). Authors such as Enrique Dussel, Rodolfo Kusch, and Aníbal Quijano have insisted on the need to think from "the other side of the border," from the exteriority of the modern/colonial world-system (Dussel, 2009).

The Andean worldview of "Buen Vivir" (Sumak Kawsay), for example, offers a radical alternative to the Western development model (Gudynas, 2011). It is not about individual and competitive "living better," but about "good coexistence" in harmony with community, nature, and the cosmos. This relational and complementary thinking, which does not seek synthesis but dynamic equilibrium of parts, is profoundly n-alectic. The relationship between the human being (runa) and nature (Pachamama) is not one of opposition or domination but of reciprocity (ayni) (Kusch, 2000).

Likewise, Latin American philosophy's insistence on critical interculturality as a political and epistemic project dialogues directly with the neutrosophic proposal (Walsh, 2009). Interculturality is not a simple multiculturalism where cultures coexist as separate entities. It is a project that seeks to build bridges of dialogue under conditions of symmetry, recognizing existing power asymmetries and working to dismantle them (Walsh, 2010). The n-alectic "neutrality" can be understood here as that "third space" of enunciation where intercultural dialogue becomes possible, a space that belongs neither to the hegemonic culture (<A>) nor to the subaltern culture (<anti-A>) but emerges from their conflictive and creative encounter.

In summary, the articulation of neutrosophy and n-alectics with Latin American philosophy provides us with a robust conceptual framework for a **decolonial pedagogy**. This pedagogy is grounded in the recognition of knowledge plurality, the valuation of indeterminacy as epistemic potency, and the search for intercultural dialogue that overcomes the traps of binary and Eurocentric thinking.

3. Comparative Analysis: From Dialectical Complexity to Decolonial N-alectics

Once both theoretical frameworks have been presented, it is possible to conduct a comparative analysis that highlights the potency of the neutrosophic-Latin American perspective for overcoming the limitations of Morin's complexity theory in the pedagogical field. This analysis will focus on three fundamental axes: the treatment of contradiction, the place of indeterminacy, and the approach to universality.

Table 1.

Comparison between Morin's Complexity Theory and the Neutrosophic-Latin American Perspective in the Pedagogical Field

Characteristic	Complexity Theory (Morin)	Neutrosophic-Latin American Perspective	Pedagogical Implications
Basic Logic	Dialectical. Focuses on tension and dialogue between opposites (order/disorder).	N-alectic. Analyzes dynamics between opposites and their zones of neutrality (<A>, <antiA>, <neutA>).	Overcoming adversarial debate. Search for common spaces and intercultural dialogue.
Treatment of Contradiction	Contradiction is an engine of thought, but a dialogical meta-unity containing it is sought.	Contradiction can coexist with non-contradiction and indeterminacy. Paraconsistent states are accepted.	The coexistence of multiple perspectives, even contradictory ones, is legitimized without the urgency of forced synthesis.
Role of Uncertainty	Uncertainty is recognized as a limit of knowledge, a "black hole" to navigate.	Indeterminacy (I) is a fundamental ontological and epistemic component, a space of potentiality and creation.	Doubt, question, and ambiguity become central pedagogical tools, not obstacles to overcome.
Universality	Proposes an abstract and reconciling universalism ("human condition," "earthly identity").	Questions abstract universals and proposes a "transmodern pluriversalism" anchored in decolonial dialogue.	Education is geopolitically situated, recognizing coloniality of knowledge and promoting South-North dialogue of knowledge.
Praxis	Offers general and abstract principles, difficult to operationalize.	Provides a formalizable logic and conceptual tools (T, I, F) that allow for more rigorous analysis.	Allows designing more precise didactic and evaluative strategies to manage complexity in the classroom.

As observed in the table, the main difference lies in the shift from dialectical logic to n-alectics. While Morin, heir to European tradition, continues to think in terms of opposing pairs whose tension must be managed, Smarandache's proposal, by introducing the neutrality component (<neut-A>), opens the game. It is no longer just about the struggle between <A> and <anti-A>, but the exploration of that vast intermediate territory. This territory is not a vacuum but a fertile field for dialogue, negotiation, and the emergence of new realities. Pedagogically, this means moving from a logic of "either one or the other" (or even "both one and the other" in Morin's best case) to a logic of "perhaps," "it depends," "neither one nor the other, but something different."

Secondly, the treatment of uncertainty is radically different. For Morin, uncertainty is something to be "confronted," a kind of inevitable enemy. For neutrosophy, indeterminacy (I) is constitutive of reality and knowledge. It is not a defect but a potency (Pi Crespo et al., 2019). A neutrosophic pedagogy does not seek to eliminate indeterminacy with definitive answers but teaches how to inhabit it, explore it, and use it as an engine for creativity and critical thinking. It is about forming students who do not fear "not knowing" but see it as the starting point of every intellectual adventure.

Finally, anchoring in Latin American philosophy allows the neutrosophic proposal to avoid Morin's abstract universalism. N-alectics, when placed in dialogue with decolonial thought, becomes a tool for critical interculturality. The <neut-A> space can be theorized as the "third

space" or "border" where hegemonic and subaltern knowledge meet and tension each other. The objective of a decolonial n-alectic pedagogy is not simply for students to "understand" cultural diversity from an external position but to experience the epistemic and political tension of that diversity and take a position within it. It is about an education that not only recognizes the complexity of the world but assumes the complexity of its own position in the power relations that structure it.

4. Toward a Latin American Neutrosophic Pedagogy: Concrete Proposals

The theoretical articulation developed thus far would have no value if it were not capable of inspiring transformative pedagogical practices. In this section, some concrete proposals are outlined, without pretension of exhaustiveness, to apply the neutrosophic-Latin American approach in curricular design, teaching practice, and evaluation.

4.1. N-alectic Curricular Design

A curriculum designed from this perspective should overcome the traditional organization by compartmentalized disciplines. Instead, it could be organized around "problematic nodes" or "generative questions" that are socially relevant and epistemically complex. For example, instead of studying "the history of the conquest of America" as closed content, one could pose the question: "What did (and does today) the encounter between Europe and America mean?"

The approach to this question would be done n-alectically:

- **<A> (Thesis):** Hegemonic sources and narratives would be analyzed, the victors' vision, the discourse of "civilization" and "progress."
- **<anti-A> (Antithesis):** Sources and narratives of indigenous peoples would be investigated, the vanquished vision, the trauma of conquest and cultural resistance.
- **<neut-A> (Neutrality/Indeterminacy):** Gray and ambiguous zones would be explored: mestizaje, religious syncretism, the figures of translators and cultural mediators, shifting alliances, internal contradictions of each side. Diverse and conflicting historiographical interpretations would also be analyzed.

The objective would not be to arrive at a "final synthesis," but for students to construct their own nuanced understanding of the phenomenon, expressed in neutrosophic terms: "I understand that the conquest was X% an act of genocidal violence (T), but also Y% a process of cultural hybridization (F), and I recognize that there is Z% of aspects that I still do not understand or that are inherently ambiguous (I)."

4.2. Teaching Practice as Intercultural Mediation

The role of the teacher in a neutrosophic pedagogy is not that of a transmitter of truths, nor even that of a "facilitator" of consensus. It is, rather, that of an **intercultural and epistemic mediator**. Their task is to create a safe classroom space where multiple perspectives can emerge and dialogue, including those that are contradictory or indeterminate.

This implies:

- **Managing uncertainty:** Instead of answering all questions, the teacher must know how to sustain the question, return it to the group, and encourage the exploration of multiple possible answers. They must model an attitude of epistemic humility, recognizing the limits of their own knowledge.
- **Making the geopolitics of knowledge visible:** The teacher must help students identify where each text, each author, each theory speaks from. Who speaks? From

what geographical, social, cultural place? What interests do they defend? What silences do they hide?

- **Fostering border thinking:** Activities should be proposed that force students to "cross the epistemic border," to put themselves in the other's place. For example, through role-playing games, simulated debates, case analysis from different cultural perspectives, or inviting members of different communities to share their knowledge.

4.3. Neutrosophic Evaluation

Evaluation is perhaps the area where binary logic (pass/fail, correct/incorrect) is most entrenched. A neutrosophic evaluation should be capable of capturing the complexity of learning.

This could translate into:

- **Learning portfolios:** Instead of a single final exam, the student could compile a portfolio showing their process over time: their initial questions, drafts, mistakes and how they overcame them, reflections on their own perspective changes.
- **N-alectic self-evaluation and co-evaluation:** Students could be asked to evaluate their own work and that of their peers using neutrosophic criteria. For example: "In this essay, I believe my argument is 70% convincing (T), but I recognize there is 20% of weak or undeveloped points (F), and 10% of exploratory ideas that I still don't know if they are valid (I)."
- **Evaluation of question-formulating ability:** Not only students' ability to give answers could be evaluated, but also their skill in formulating pertinent, complex, and well-founded questions. A good question can be a more valuable indicator of learning than a memorized answer.

4.4. From Statistical Evaluation to Configurational Causality: From fsQCA to nQCA

One of the areas where neutrosophic pedagogy can offer a tangible methodological advance is in educational research and systems evaluation. Traditionally, analysis of educational success or failure has been based on statistical methods that seek linear correlations between isolated variables (e.g., socioeconomic level and academic performance) (Cilesiz, 2020). This reductionist approach is incapable of capturing the complexity of educational phenomena, where different combinations of factors can lead to the same result (equifinality).

A more sophisticated alternative is **Fuzzy-Set Qualitative Comparative Analysis (fsQCA)**, a methodology that allows identifying complex causal configurations (Ragin, 2008). However, fsQCA, by being based on fuzzy logic, continues to operate on the truth/falsity axis (membership/non-membership to a set).

The neutrosophic proposal goes a step further, suggesting the transition to a **Neutrosophic Qualitative Comparative Analysis (nQCA)**. This methodology, still under development, would incorporate the dimension of indeterminacy (I) in configurational analysis. Instead of simply calibrating the degree of membership of a case to a set (e.g., "school with high parental involvement"), nQCA would allow calibrating the degree of membership (T), the degree of non-membership (F), and crucially, the degree of indeterminacy or ambiguity (I).

For example, when analyzing the educational success of a school, we could find a causal configuration like the following:

*HIGH_FUNDING * ~low_teacher_student_ratio * HIGH_CURRICULAR_AUTONOMY * INDETERMINATE_LEADERSHIP → ACADEMIC_SUCCESS*

This expression would indicate that academic success occurs in schools with high funding, a teacher-student ratio that is not low (i.e., can be medium or high), high curricular autonomy, and where the type of leadership is ambiguous or indeterminate (sometimes authoritarian, sometimes democratic, or simply not a clearly definable factor). nQCA would allow treating that indeterminacy not as "noise" in the data but as an integral part of the causal configuration (Vázquez & Smarandache, 2025).

This methodological proposal implies a radical change: instead of seeking "the" cause of educational success, multiple neutrosophic causal configurations that can lead to it are sought.

5. Application of Neutrosophy in AI Systems and LLMs: Toward an Augmented Pedagogy

An emerging area of great relevance for contemporary pedagogy is the integration of neutrosophic logic in working with Large Language Models (LLMs). LLMs such as ChatGPT, Claude, or Gemini have become increasingly used pedagogical tools in educational contexts (Yu et al., 2024). However, their uncritical application can reinforce the binary thinking we seek to overcome. Neutrosophy offers a framework for "training" these systems to generate more nuanced and complex analyses.

5.1. The Problem: LLMs and Binary Thinking

LLMs, trained primarily on textual corpora from Western tradition, tend to reproduce patterns of binary thinking: true/false, correct/incorrect, good/bad (Liu et al., 2025). When a student asks an LLM "Is artificial intelligence a threat?", the typical response oscillates between two extreme positions, without adequately exploring the zone of indeterminacy where the most important questions reside. This limitation is not technical but epistemological: LLMs reflect the logic of the data with which they were trained.

5.2. The Solution: Neutrosophic Prompts for LLMs

An innovative pedagogical strategy is to design prompts that explicitly instruct the LLM to analyze complex topics using the neutrosophic triad (T, I, F). The following is an example of a neutrosophic prompt that can be used with any LLM:

Role: Act as an Expert Professor in Neutrosophic Logic and Critical Thinking.

Objective: Help students analyze a complex topic avoiding binary thinking (black/white) and using the neutrosophic triad (T, I, F).

Task: I will provide you with a statement or historical/scientific event. Your job is to generate an educational analysis that breaks down the topic into three components:

- **Degree of Truth (T):** Present solid evidence, proven facts, and arguments that validate the statement.
- **Degree of Falsity (F):** Present counterarguments, common errors, or contexts where the statement fails spectacularly.
- **Degree of Indeterminacy (I):** Analyze which aspects are ambiguous, what information is missing, what variables are subjective or neutral, and where paradox exists.

Output Format: Use an academic but accessible tone. At the end, assign an estimated symbolic valuation (for example: T: 0.6, I: 0.3, F: 0.1) to illustrate the weight of each component (it doesn't have to be mathematically exact, but conceptual). End with a "Provocative Question" that forces the student to investigate the zone of Indeterminacy.

5.3. Application Case: Neutrosophic Analysis of Remote Work

To illustrate how this methodology works in practice, let us consider the analysis of the statement: "Remote work (home office) is superior to in-person work for productivity and well-being."

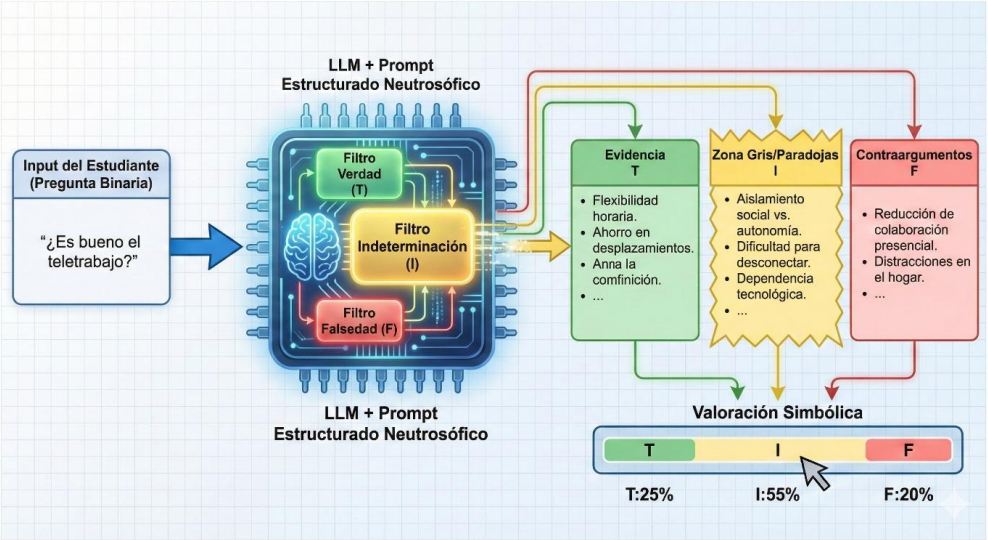

Figure 2. *Processing flow of a structured neutrosophic prompt in an LLM*

When applying the neutrosophic prompt to an LLM, we obtain a structured analysis that avoids false dichotomy:

Truth Component (T) - Efficiency and Autonomy:

It is truly true that hours are recovered by eliminating the commute, which mathematically increases available time. For tasks requiring high individual concentration (programming, writing), home isolation is usually superior to the noise of an open office. Additionally, remote work allows access to global talent without geographical barriers, democratizing job opportunities.

Falsity Component (F) - Isolation and Disconnection:

It is false that collaborative innovation occurs equally well via videoconference. The "hallway moments" where many creative ideas spontaneously arise are lost. Remote work has increased ergonomic problems and sedentariness by reducing natural daily mobility. For junior employees, remote work is inferior; they learn less by osmosis by not seeing their mentors work.

Indeterminacy Component (I) - The Gray and Hybrid Zone:

The availability paradox: Do you work less or more? The boundary becomes indeterminate. Many employees experience "digital burnout" because they never "leave" the office, even at home. Productivity is indeterminate because it depends on variables external to the company: Does the employee have a quiet office or work at the kitchen table with small children? What

for an introvert is "peace" (T), for an extrovert is "anxiety" (F). The "superiority" of the model is subjective to the individual.

Estimated Symbolic Valuation:

$$\langle T(0.40), I(0.45), F(0.15) \rangle$$

Indeterminacy is the highest variable because the success of remote work depends almost exclusively on the individual's self-discipline and environment, not the model itself.

Provocative Question:

Given that productivity is indeterminate and varies according to the employee's psychological profile, should companies stop imposing universal policies (everyone comes or everyone stays) and move to personalized "neutrosophic" contracts by objectives?

5.4. Pedagogical Implications

This application of neutrosophy with LLMs has profound pedagogical implications:

- **Overcoming Binary Thinking:** Students learn to recognize that most complex problems do not have simple true/false answers but require multidimensional analysis.
- **Valuing Indeterminacy:** By assigning significant weight to the I component, students are taught that uncertainty is not a defect but a legitimate characteristic of knowledge.
- **Augmented Critical Thinking:** LLMs, guided by neutrosophic prompts, become tools for developing critical thinking, not substitutes for it.
- **Democratization of Complex Analysis:** This methodology makes complex systems analysis accessible to students at any level, from secondary school to postgraduate.
- **Preparation for Uncertainty:** In a world characterized by ambiguity and complexity, this pedagogy prepares students to make informed decisions in contexts of indeterminacy.

Conclusion

Pedagogy, in its constant search to form human beings capable of understanding and transforming their reality, finds itself at a crossroads. Models based on simplification and certainty have proven insufficient for a world characterized by interconnection, uncertainty, and conflict. Edgar Morin's theory of complexity represented a crucial step in diagnosing this insufficiency and proposing a reconnecting thinking (Morin, 2001). However, as we have argued, his proposal, anchored in European dialectics, does not offer the logical or political tools to go beyond diagnosis and construct a truly emancipatory pedagogical praxis, especially in contexts marked by the colonial wound like Latin America.

This article has proposed an alternative and superseding path: the articulation of Florentin Smarandache's neutrosophy and n-alectics with the richness of critical Latin American worldview and philosophy (Smarandache, 2014). The introduction of the indeterminacy component (I) as a central element, and the shift from dialectical to n-alectic logic, allows us not only to think complexity but to inhabit it in a richer and more potent way. It is no longer about managing tension between opposites but exploring the vast and fertile territory of neutrality, ambiguity, and multiplicity.

By placing this conceptual framework in dialogue with "Buen Vivir," critical interculturality, and decolonial thought, we have outlined the foundations of a **Latin American neutrosophic pedagogy**. This pedagogy is:

- **Epistemically plural:** It recognizes the validity of multiple knowledge systems and logics beyond the Western canon (Walsh, 2009).
- **Politically decolonial:** It questions the geopolitics of knowledge and works to dismantle the power structures underlying education (Quijano, 2000).
- **Ethically relational:** It promotes an ethics of care, reciprocity, and responsibility with community and nature (Kusch, 2000).
- **Practically transformative:** It offers concrete tools to redesign curriculum, teaching practice, and evaluation, orienting them toward the formation of critical, creative thinking capable of navigating uncertainty.

To supersede Morin's complexity does not mean discarding it but integrating it into a broader and more potent framework. Neutrosophy and n-alectics do not deny dialectics; they generalize it. Similarly, a Latin American neutrosophic pedagogy does not ignore the contributions of complex thinking but situates them, critiques them, and enriches them from the exteriority of the colonial border. The path is open. The construction of an education that radically embraces uncertainty, diversity, and social justice is the great challenge of our time, and the perspective outlined here hopes to be a significant contribution in that direction.

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